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F2Y YSY Y3201
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INT CL[5] B60T, F16D, G05G

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(54) **Wind-to-load parking brake arrangement and method**

(57) During assembly of a parking brake system, a main bushing 120 is rotated relative to pivot pin 114 and to operating lever 112 so that bracket 127 drives the inner leg of spring 126 (the outer leg of which abuts projection 124*b* in a cable track 124), to tension the latter until a desired tension is indicated by a load cell 186, at which point the bushing 120 is permanently staked or welded to the operating lever 112. A holdout pin 176 is then inserted to prevent rotation of the cable track 124 relative to the lever, and the load cell 186 is removed, whereby the system is maintained in the accurately preloaded condition prior to installation in a vehicle parking brake system. In operation, the lever, sector 111 and bushing 120 constitute the unit and ratchet 118, and cable track 124, to which cable 104*b* is connected, constitute a second unit, and depressing the lever, to apply a parking brake, causes, via pawl 132, the two units to rotate together, and rotation of a gear 170 engaging sector 111. Helical spring brake 172 mounted on gear 170 causes lever 112 to be held in its depressed state until a lever 162 is pivoted manually or via a vacuum motor 168 to release the helical spring brake thus permitting the units to return to their initial positions, at which point pawl 132 is released from ratchet 118 to allow spring 126 to automatically take up slack in the cable.

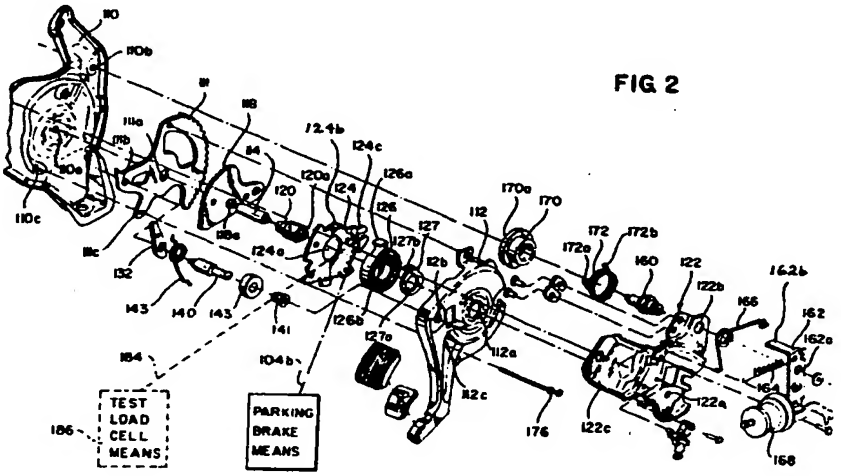

FIG 2

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PRIOR ART

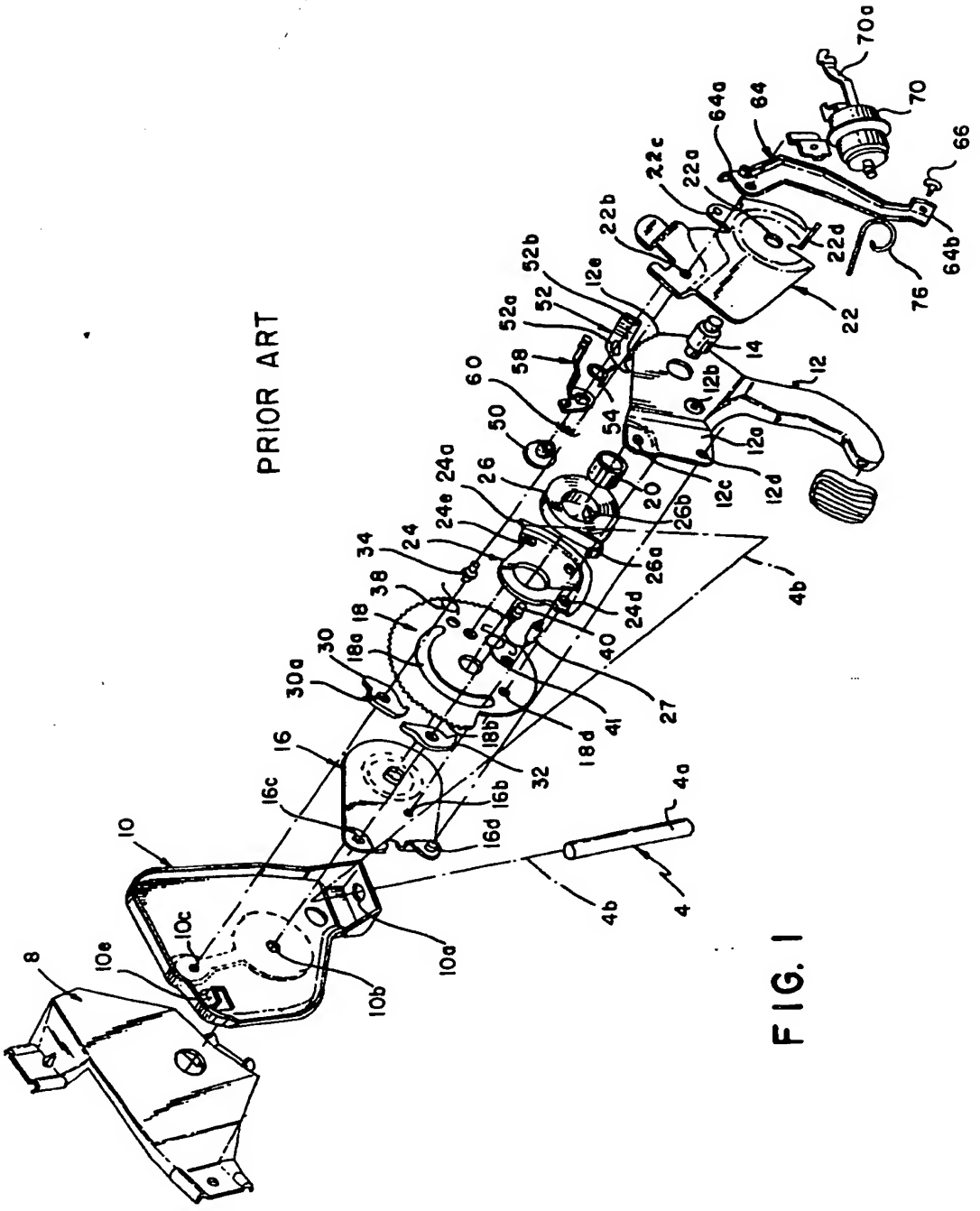
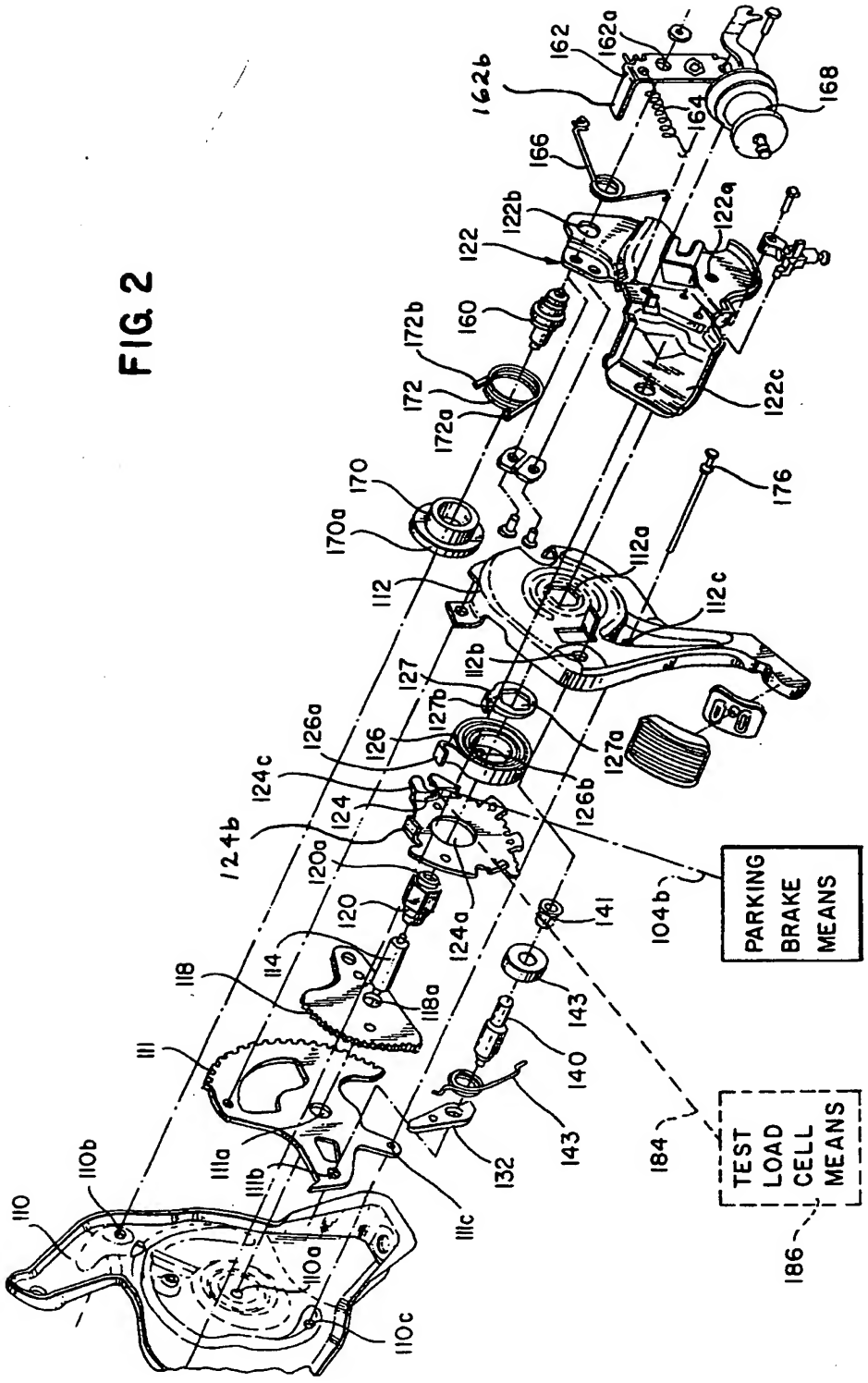


FIG. 1

FIG. 2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110b
110a
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111
111a
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118a
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126a
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170
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172a
172b
160
122
122a
122b
122c
162
162a
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176
132
140
141
143
143
184
186
104b
PARKING BRAKE MEANS
TEST LOAD CELL MEANS

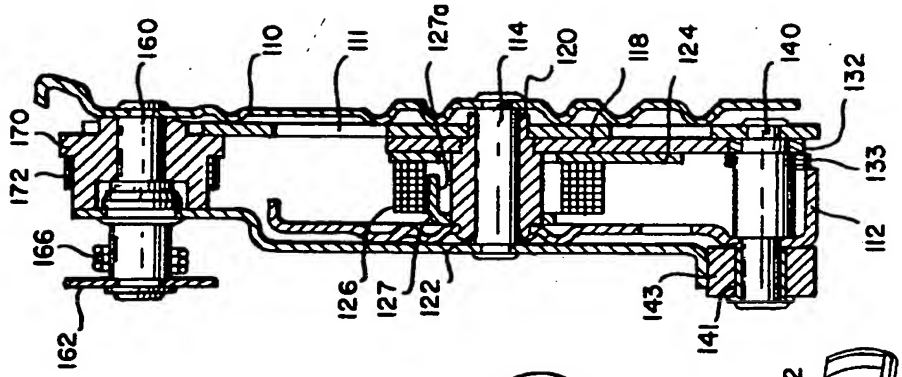

FIG. 5

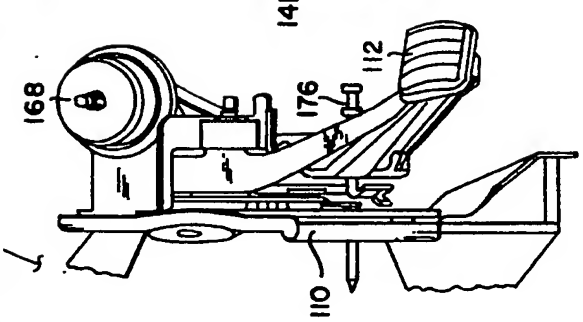

FIG. 4

FIG. 3

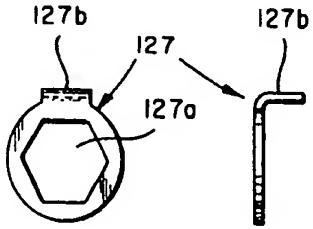

FIG. 6

FIG. 7

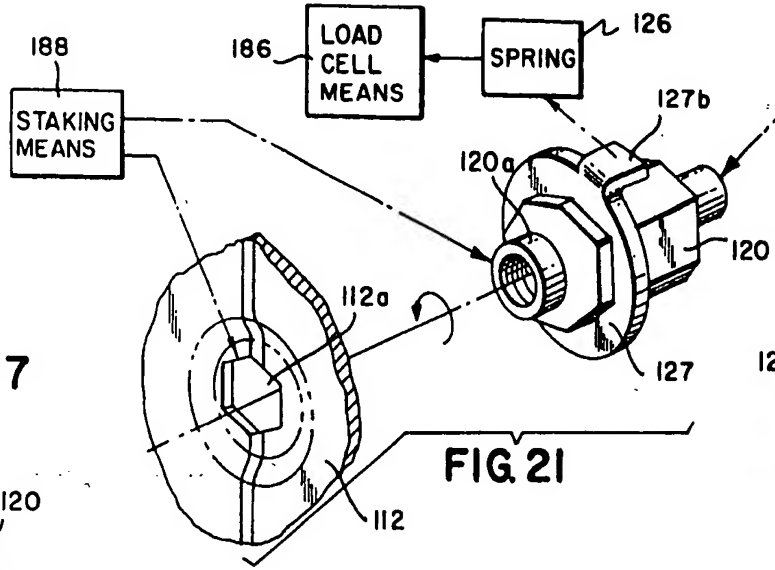

FIG. 21

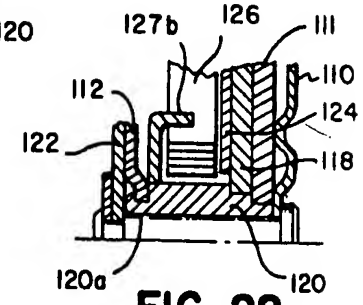

FIG. 22

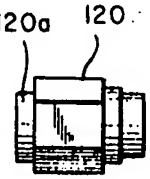

FIG. 8

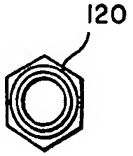

FIG. 9

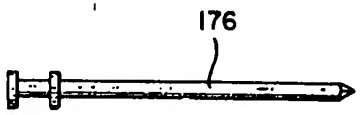

FIG. 10

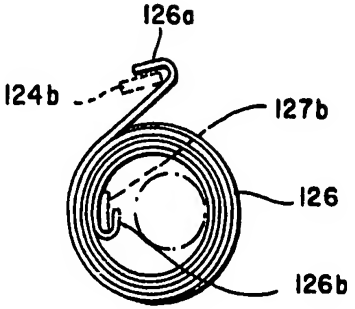

FIG. 11

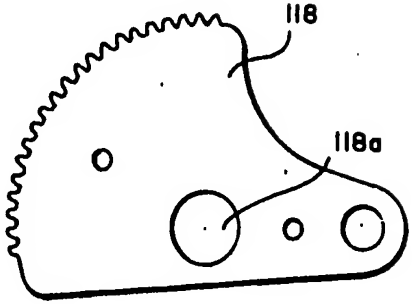

FIG. 12

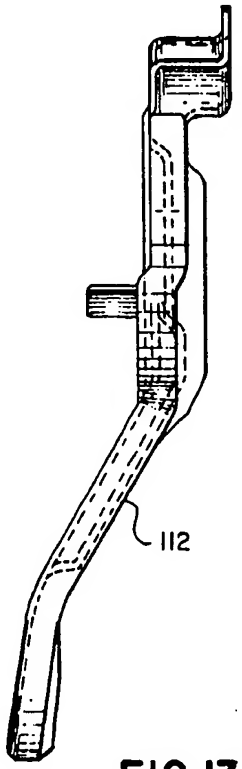

FIG. 13

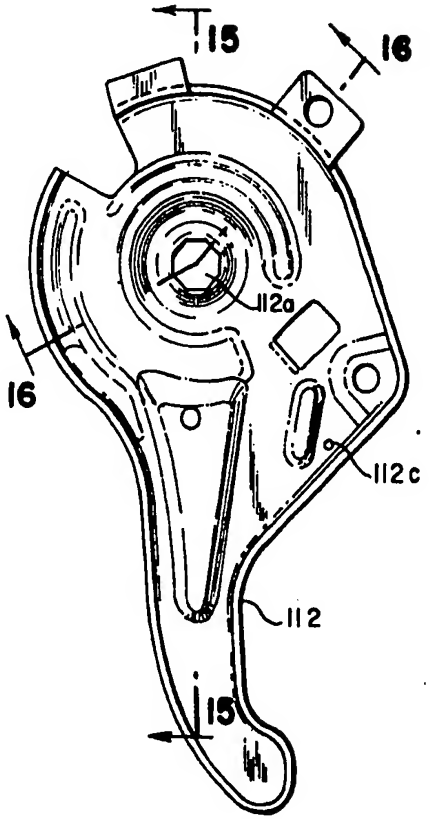

FIG. 14

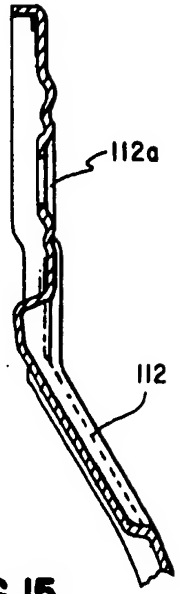

FIG. 15

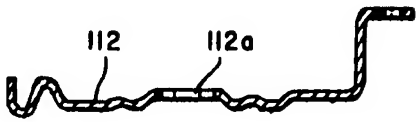

FIG. 16

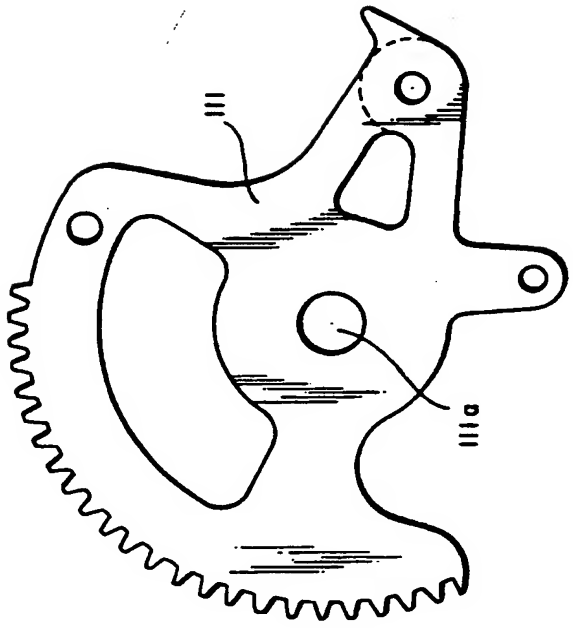

FIG. 20

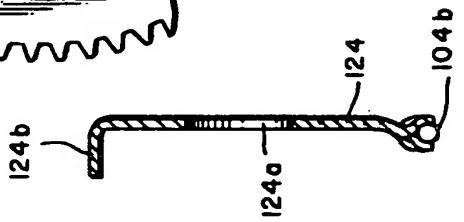

FIG. 19

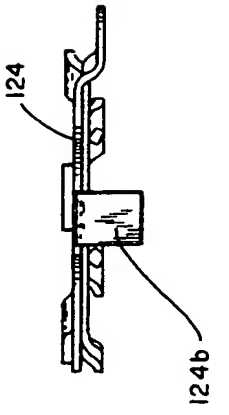

FIG. 18

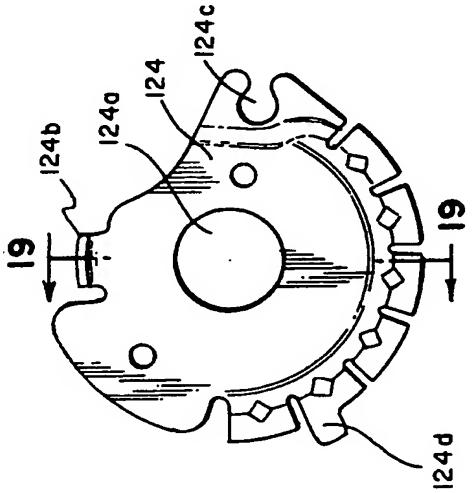

FIG. 17

WIND-TO-LOAD PARKING BRAKE ARRANGEMENT AND METHOD

This invention relates to vehicle parking brake systems, particularly to vehicle parking brake systems of the "wind-to-load" type.

Parking brake systems for automotive vehicles are well known in the prior art, as evidenced by US-A-4612823, US-A-3487716, US-A-3693472, US-A-4872368 and US-A-4270406 among others.

In US-A-4841798 a foot-operated self-adjusting parking brake apparatus is disclosed having "load-to-position" means for automatically removing slack from the vehicle parking brake system. While this known system has proven to be most worthwhile in practice, it has been found to be desirable to more accurately preload the adjusting spring with a predetermined load, whereby a single parking brake system might be customized for installation in a large number of vehicles having different installation specifications.

According to a first aspect of the present invention there is provided apparatus for operating the inner member of a coaxial vehicle parking brake cable between brake-engaged and brake-released conditions, comprising :

(a) mounting bracket means adapted for connection with the vehicle;

(b) a foot-operated lever;

(c) means including a main pivot shaft pivotally connecting said lever for pivotal movement between brake-released and brake-engaged positions relative to said mounting bracket means;

(d) cable tensioning means including a cable track rotatably mounted on said shaft and adapted for connection with one end of said inner cable member, thereby to tension said inner cable member when said lever is in the brake-engaged position;

(e) means for releasably connecting said cable track with said lever;

(f) means normally preventing return movement of said lever toward its brake released position relative to said mounting bracket means;

(g) adjuster spring means biasing said cable track in the cable tensioning direction relative to said lever, said adjuster spring means including :

(1) a main bushing rotatably mounted on said pivot shaft;

(2) a spiral spring arranged concentrically about said main bushing and having outer and inner end portions;

(3) means connecting said outer spring leg with said cable track for rotating the same in the cable-tensioning direction;

(4) means connecting said inner spring leg with said bushing; and

(5) means securing said bushing, when said inner and outer spring legs are displaced to effect a predetermined preloading of said spring, to said lever;

(h) means operable when said lever is in the brake-engaged position for releasing said lever return preventing means, thereby to permit return of said lever by cable tension to its brake-released position; and

(i) means operable when said lever is adjacent its brake-released position for disconnecting said cable track from said lever, whereby said adjuster spring means is operable to pivot said cable ratchet relative to said housing and to said lever, thereby to tension the cable and to remove slack therefrom.

According to a second aspect of the present invention there is provided a method for assembling a

parking brake system of the self-adjusting cable tensioning type, including a mounting bracket, a main pivot shaft connected with said mounting bracket, a cable track member rotatably mounted on said pivot shaft, said cable track member being adapted for connection with a parking brake cable, a main bushing rotatably mounted on said pivot shaft, a spiral adjuster spring arranged concentrically about said main bushing, said spring being connected at its inner and outer ends with said bushing and with said cable track member, respectively, and an operating lever rotatably mounted on said pivot shaft between brake-applied and brake-released positions relative to said mounting bracket, comprising the steps of :

(a) connecting a load cell with said cable track member;

(b) rotating said main bushing in a direction to wind the turns of said spring together and thereby increase the tension of said spring to a predetermined value as indicated by said load cell means; and

(c) securing said main bushing to said lever, thereby to maintain the spring in the preloaded condition.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which :

Fig. 1 is an exploded view of a parking brake system of the prior art;

Fig. 2 is an exploded view of the parking brake system of the present invention;

Figs. 3 and 4 are side and front elevational views, respectively, of the parking brake assembly of Fig. 2;

Fig. 5 is a sectional view taken along line 5-5 of Fig. 3;

Figs. 6 and 7 are front and side elevational views, respectively, of the spring wind bracket of Fig. 2;

Figs. 8 and 9 are front and side elevational views, respectively, of the main bushing of Fig. 2;

Fig. 10 is an elevational view of the lockout pin of Fig. 1;

Fig. 11 is an elevational view of the spiral adjuster spring of Fig. 2;

Fig. 12 is an elevational view of the ratchet of Fig. 2;

Figs. 13 and 14 are side and front elevational views respectively, of the pedal member of Fig. 2, and Figs. 15 and 16 are sectional views taken along lines 15-15 and 16-16, respectively of Fig. 14;

Figs. 17 and 18 are front elevation and top plan views, respectively, of the cable track member of Fig. 2, and Fig. 19 is a sectional view taken along line 19-19 of Fig. 17;

Fig. 20 is a front elevational view of the sector member of Fig. 2;

Fig. 21 is a detailed schematic illustration of a staking method for "winding-to-load" the spiral spring during the assembly of the apparatus of Fig. 2; and

Fig. 22 is a detailed sectional view illustrating the staked bushing relative to its associated parts.

Detailed Description

Prior Art System of Fig. 1

Referring first to the prior art apparatus of Fig. 1 -- which is the aforementioned "wind-to-position" self-adjusting brake system of the prior Porter et al patent No. 4,841,798 --

the foot-operated parking brake apparatus 2 for operating the coaxial brake control cable 4 associated with the parking brake 6 of a motor vehicle includes a riser bracket 8 to which is secured (by clinching, welding, or the like) a mounting bracket 10. This unit is fastened to the fire wall of the vehicle by suitable fastening means, such as bolts (not shown). The outer cable member 4a is fastened at one end in an opening 10a contained in the mounting bracket 10, and the inner cable strand 4b is connected for operation by the foot-operated parking brake lever 12.

A main pivot shaft 14 is secured at one end in an opening 10b contained in mounting bracket 10, and successively mounted in concentric relation on this shaft are drive plate 16, ratchet 18, longitudinally-split pivot sleeve 20, and the plate-like upper portion 12a of lever 12. The left hand end of pivot sleeve 20 is secured (by welding, for example) with the ratchet 18. The other end of pivot shaft 14 is supported in an opening 22a of cover member 22 that is secured (by clinching, welding or the like) to mounting bracket 22. Mounted concentrically about the pivot sleeve 20 are a cable track member 24 and a spiral adjuster spring 26, the cable track member having a curved flange portion 24a that extends concentrically beneath the adjuster spring and that is connected at its upper edge with the inner strand member 4b of the parking brake cable. Ratchet 18 contains an arcuate slot 18a that receives a drive stud 27 the ends of which are supported in openings 12b and 16b contained in lever 12 and drive plate

16, respectively. Associated with the teeth 18b of ratchet 18 are a lock pawl 30 and a drive pawl 32. Lock pawl 30 is pivotally mounted on a pivot pin 34 that is supported at one end in opening 10c contained in mounting bracket 10, the other end of this pivot pin extending through a corresponding opening 22b contained in cover member 22. Coil spring 38 mounted on pivot pin 34 normally biases pawl 30 toward engagement with the ratchet teeth 18b. Similarly, drive pawl 32 is pivotally mounted on pivot pin 40 the ends of which are supported in corresponding openings 12c and 16c contained in lever 12 and drive plate 16, said drive pawl being normally biased by coil spring 41 toward engagement with ratchet 18. Lever 12, drive stud 27 and drive plate 16 are further connected together as a first assembly by a bolt (not shown) that extends through lever opening 12d and drive plate opening 16d, and cable track member 24 is bolted to ratchet 18 by bolts (not shown) that extend through corresponding openings 18d and 24d, and 18e, and 24c, respectively, thereby to define with pivot sleeve 20 a second assembly. The outer end 26a of the adjuster spring is bent outwardly for reaction with drive stud 27, and the inner end of the adjuster spring is bent inwardly for insertion within longitudinal slot 20a of pivot sleeve 20. Thus, one end of the adjuster spring reacts with the first assembly including drive stud 27, drive plate 16 and foot-operated lever 12, and the other end of the adjuster spring reacts with the second assembly including pivot sleeve 20, ratchet 18 and cable track 24.

Pivotally mounted on a pivot pin 50 mounted in opening 22c contained in cover 22 is a pedal pawl 52 that is biased by coil spring 54 into engagement with ratchet teeth 12e provided on the plate-like upper portion 12a of lever 12. Also pivotally mounted on pivot pin 50 is a manual release lever 58 that is biased in the counterclockwise direction in Fig. 1 by a coil spring 60. This lever 58 is operable by the parking brake manual release means (not shown), thereby to pivot pedal pawl 52 to the released position relative to pedal ratchet teeth 12e. Pivotally mounted at one end on the end of pivot pin 34 that extends through the pivot opening 30a of lock pawl 30 is a lock pawl release lever 64 having a first lateral tab portion 64a arranged to engage the lock pawl 30 for pivoting the same in the pawl-released direction relative to ratchet 18 against the biasing force of the return spring 38. At its other end, the lock pawl lever has a second lateral tab portion 64b provided with a synthetic plastic button 66 arranged for engagement by the adjacent surface of foot pedal 12, so that when the foot pedal is in its brake-released position, release lever 64 pivots pawl 30 to the unlocked condition relative to ratchet 18. Spring 60 is connected between lock pawl release lever 64 and manual release lever 58.

A vacuum-responsive diaphragm motor 70 is secured to the cover 22 and includes an output shaft 70a arranged for cooperation with slot 52b to disengage pedal pawl 52 from pedal ratchet teeth 12e upon the occurrence of vacuum from source 72 (for example, upon firing of the internal combustion engine of the vehicle).

During assembly the ratchet 18 and track sub-assembly is fully rotated in the clockwise direction to drive the adjuster spring leg 26b to wind the adjuster spring 26 while the drive stud 27 holds the adjuster spring leg 26a stationary, thereby winding the adjuster spring 26 to its maximum load position. A shipping pin 76 is inserted through the cover 22, adjuster/track sub-assembly 24, 18, and into the mounting bracket 10, thereby to maintain the adjuster mechanism in a pre-load store until the cable is installed in the vehicle, whereupon pin 76 is pulled and the self-adjuster operates to take up cable slack.

When in the fully-released the condition, the adjuster/track sub-assembly 26,24 is allowed to freely rotate in a direction so as to cause greater cable tension until a point of equilibrium is reached, thereby insuring a minimum tension and lack of cable slack at each stroke. The lock pawl 30 is held out by the lock pawl release lever 64 which is rotated to the "release position" by the pedal 12 owing to the engagement between lever 12 and button 66. The drive pawl 32 is held out of engagement with ratchet teeth 18b by a fixed tab 10e on the mounting bracket 10, thereby allowing free rotation of the self-adjuster in either the clockwise or the counterclockwise direction. The ends 26a and 26b of the preloaded adjuster spring 26 react between the drive stud 27 and the ratchet pivot sleeve 20, thereby to rotate the ratchet 18 and the cable track 24 in the cable-tensioning direction relative to lever 12. Thus, the advantage is presented of "over adjust" safeguard, owing to the lock pawl 20 and drive pawl 32 being maintained in the disengaged condition.

The operation of this "wind-to-position" prior art system is described in detail in the aforementioned Porter et al patent No. 4,841,798, and will not be repeated here. It suffices to say that as brake pedal 12 is depressed, drive pin 27 and adjuster spring 26 drive ratchet 18 and cable track 24 to tension inner cable member 4b to apply the parking brake. At any time after the pedal pawl 52 begins to ratchet, the operator's foot may be removed and the mechanism will maintain the resultant cable load.

After the control mechanism has been set, upon actuation of the manual release lever 58 (either manually by the manual release control means 59, or automatically by the vacuum means 72 upon the starting of the vehicle), the manual release lever 58 pivots about its pivot shaft 50 which in turn causes the pedal pawl 52 to rotate to a released position, thereby disengaging the pedal teeth 12e to allow the pedal 12 to rotate in the clockwise direction, owing to the force created by the adjuster spring end 26a transmitted through the drive stud 27. If the control apparatus is optionally equipped with the vacuum canister, the vacuum canister arm 70a will cycle under vacuum to position 70a, thereby engaging slot 52b to release the pedal pawl 52, initiating the sequence discussed above.

During the final phase of the release cycle, as the adjuster spring leg 26a rotates with the pedal, the adjuster spring leg 26b remains fixed with the ratchet. Once the adjuster spring leg 26a drives the pedal 12 to a position at which the pedal 12

starts to rotate the lock pawl release lever 64, the lock pawl release lever is rotated to a position which in turn rotates the lock pawl 30 to a released position.

During the return of the pedal 12 toward its intermediate position, the drive pawl 32 freely moves in and out of the ratchet teeth 18b. As the pedal further rotates the drive pawl becomes disengaged as a result of contact with the mounting bracket fixed tab portion 10e, thereby allowing the ratchet 18 and cable track 24 to pivot to their OFF positions, respectively, whereupon the adjuster spring leg 26b rewinds the adjuster spring 26 owing to its attachment through slot 20a in the pivot sleeve 20, and since the pivot sleeve 20 is fixed to the ratchet 18, a dampening effect is created upon the cable load release. Simultaneously, the adjuster spring leg 26b rewinds to the position 26b'.

The Present Invention (Figs. 2-22)

As distinguished from the prior "wind-to-position" system of the Porter et al patent No. 4,841,798, the present invention relates to a parking brake cable adjusting system of the "wind-to-load" type, wherein the adjuster spring is accurately wound to a given preload prior to securement to the associated foot-operated lever.

Referring to Fig. 2, the system includes a mounting bracket 110, a sector 111, a ratchet 118, a main pivot pin or rivet 114, a main bushing 120 having a hexagonal cross sectional configuration, a cable track 124 to which the parking brake inner

cable member 104b is connected, a spiral adjuster spring 126, an annular spring wind bracket 127 having a hexagonal bore for receiving the main bushing 120, a foot-operated pedal or lever 112 containing a non-circular central opening 112a, and a cover plate 122. The sector 111 and the pedal lever 112 are rigidly connected together, and the ratchet 118 is rigidly connected with the cable track 124. Ratchet drive pawl 132 and ratchet spring 133 are mounted on a pivot pin 140 the ends of which are supported within corresponding openings 111b and 112b contained in the sector 111 and the lever 112, respectively. Bushing 141 and annular bumper 143 are mounted concentrically on the pin 140 intermediate the pawl 132 and lever 112. Lockout pin 176 is adapted for insertion into opening 110c in mounting bracket 110 via openings 112c and 111c in lever 112 and sector 111, respectively.

Cover member 122 is rigidly connected with mounting bracket 110, the ends of main pivot rivet 114 being secured between openings 110a and 122a in the mounting bracket and cover members. Also gear drum rivet 160 is mounted at one end in opening 110b in the mounting bracket, and at its other end, the rivet extends through corresponding openings 122b and 162a in cover 122 and pivotable release arm 162. Rotatably mounted on rivet 160 is a gear drum 170 having teeth 170a that mesh with the teeth of sector 111. Concentrically mounted on the cylindrical body portion of the gear drum is a helical clutch spring 172 that is normally biased concentrically inwardly into frictional engagement with the circumferential

surface of the gear drum. Clutch spring arm portion 172a is clamped to cover plate 122 by clamp bracket 173. Upon separation of the terminal arm portions 172a and 172b, the clutch spring is expanded relative to the associated circumferential surface of the gear drum, thereby to release the same. The direction of turns of the clutch spring 172 is such that during counter-clockwise pivotal movement of the pedal lever 112 in the brake-applying direction, gear drum 170 is freely driven by the teeth of sector 111 connected with lever 112. However, when the application of force to lever 112 is interrupted, the turns of clutch spring 172 will tightly engage the surface of gear drum 170, and thereby prevent further rotation thereof.

Release arm 162 has an orthogonally arranged tab portion 162b that extends adjacent clutch spring arm 172b, whereby upon pivotal movement of release arm 162 in the clockwise direction -- either by the application of force to release cable spring by release cable 180 (Fig. 2) or by operation of vacuum motor 168 -- clutch spring 172 is expanded to release gear drum 170 and parking brake lever 112.

The inner end 126b of adjuster spring 126 engages tab portion 127b of bracket 127 as shown in Fig. 11, and the lateral tab portion 124b of cable track 124 (Figs. 17-19), engages outer end portion 126a of adjuster spring 126 as shown in Figs. 3 and 11.

The adjusting spring 126 is preloaded to a desired tension during the assembly of the parking brake system, whereupon the system is

caged by lockout pin 176 until the parking brake system is installed in a vehicle. Referring to Figs. 2, 21 and 22, there is temporarily connected with the slot 124c of cable track member 124 one end of a test cable 184 the other end of which leads to a test load cell 186. With lever 112, sector 111, ratchet 118 and cable track 124 maintained in place, main bushing 120 is rotated by expanding mandrel means 188 to displace the inner spring leg 126b (by tab 127b of bracket 127) in a direction to tighten the adjuster spring to a given predetermined load as read by the load cell means 186. This desired loading might be on the order of 10 to 40 pounds, depending on the specifications of the specific vehicle into which the system is to be subsequently installed. After this given loading has been obtained (as read by the load cell), the reduced end extremity of main bushing 120 is permanently secured to the lever 112. In the illustrated embodiment, the end of the bushing is deformed by staking means 188 into permanent deformation within the non-circular opening 112a of lever 112, as schematically shown in Figs. 21 and 22. Another manner of securing the bushing to the lever is by welding. The lockout pin 176 is then inserted to lock the lever 112 against movement relative to mounting bracket 14. Furthermore, the lockout pin extends beneath tab 124d of cable 124 to prevent rotational movement of cable track 124 and ratchet 118 relative to mounting bracket 110. The test cable 184 leading to load cell 186 is then disconnected from slot 124c of cable track 124,

whereupon the assembly is caged for transport and subsequent installation in a motor vehicle. Following installation, the pin 176 is removed, and spring 126 expands to rotate cable track 124 to take up undesired slack from the cable.

The operation of the parking brake system is similar to that described in connection with the aforementioned Porter et al patent. It should be mentioned that when clutch spring 172 is expanded to release gear drum 170 for the return of lever 112 from the brake-applied position, pawl 132 is released from ratchet 118 by engagement with a corresponding surface 122c (Fig. 2) within cover plate 122 when the lever returns to its fully released position.

One example of a suitable flowable metal from which the stakable metal main bushing 120 might be formed is AISI 1215 steel.

The illustrated embodiment of the invention thus provides an improved "wind-to-load" parking brake cable-slack self-adjusting system, and method for assembling the same, wherein the spiral adjuster spring is accurately preloaded to a predetermined distinctive load by the rotation of the main bushing to displace the inner spring end relative to the outer spring end, whereupon the bushing is secured to the operating lever.

More specifically, a main bushing member is provided having a bracket member non-rotatably mounted thereon for engaging the inner end of the spiral adjuster spring. A load cell is connected with the cable track, and a rotatable expanding mandrel rotatably drives the bushing to wind the spiral spring with the outer spring end held stationary (i.e. in a manner similar to the winding of a clock). When a given load is applied to the spring as read by the load cell, the bushing is permanently fastened to the foot-operated pedal lever, for example, by staking or welding. In the case of staking, the lever has a central non-circular opening within which the adjacent end of the bushing is

permanently fastened.

It will be apparent that the preloading and staking concept has utility in areas other than in parking brake self-adjusting cable systems.

CLAIMS

1. Apparatus for operating the inner member of a coaxial vehicle parking brake cable between brake-engaged and brake-released conditions, comprising:

(a) mounting bracket means adapted for connection with the vehicle;
(b) a foot-operated lever;
(c) means including a main pivot shaft pivotally connecting said lever for pivotal movement between brake-released and brake-engaged positions relative to said mounting bracket means;
(d) cable tensioning means including a cable track rotatably mounted on said shaft and adapted for connection with one end of said inner cable member, thereby to tension said inner cable member when said lever is in the brake-engaged position;
(e) means for releasably connecting said cable track with said lever;
(f) means normally preventing return movement of said lever toward its brake-released position relative to said mounting bracket means;
(g) adjuster spring means biasing said cable track in the cable tensioning direction relative to said lever, said adjuster spring means including:
    (1) a main bushing rotatably mounted on said pivot shaft;
    (2) a spiral spring arranged concentrically about said main bushing and having outer and inner end portions;
    (3) means connecting said outer spring leg with said cable track for rotating the same in the cable-tensioning direction;

(4) means connecting said inner spring leg with said bushing; and

(5) means securing said bushing, when said inner and outer spring legs are displaced to effect a predetermined preloading of said spring, to said lever;

(h) means operable when said lever is in the brake-engaged position for releasing said lever return preventing means, thereby to permit return of said lever by cable tension to its brake-released position; and

(i) means operable when said lever is adjacent its brake-released position for disconnecting said cable track from said lever, whereby said adjuster spring means is operable to pivot said cable ratchet relative to said housing and to said lever, thereby to tension the cable and to remove slack therefrom.

2. Apparatus as claimed in claim 1, wherein said lever has a non-circular oversized opening for receiving said main pivot shaft; and further wherein one end of said main bushing extends concentrically intermediate said main pivot shaft and said lever and is staked within said non-circular opening, thereby to secure said bushing to said lever.

3. Apparatus as claimed in claim 1 or claim 2 and further including:

(j) means for winding said inner spring leg relative to said outer spring leg to effect the pre-determined preloading of said adjuster spring.

4. Apparatus as claimed in claim 3, wherein said cable tensioning means includes a ratchet connected with said cable track means, and a pawl connected with said lever,

said cable track member including means adapted for connection with said inner parking brake cable member; and further including:

(k) load cell means connected with said cable track member for maintaining said outer spring leg stationary during the winding of said adjuster spring and for presenting a visual indication of the magnitude of the preload.

5. Apparatus as claimed in claim 4, and further including staking means for staking said bushing one end to said lever non-circular opening when said load cell means indicates that said spring has been preloaded to the given value.

6. Apparatus as claimed in any of the preceding claims, wherein said means normally preventing return movement of said lever toward its brake released position includes:

(1) a sector connected with said lever, said sector having gear teeth;

(2) a gear drum rotatably connected with said mounting bracket, said gear drum having gear teeth in engagement with said sector teeth, said gear drum also having a cylindrical portion; and

(3) a helical clutch spring arranged concentrically about said gear drum cylindrical portion, said clutch spring normally being radially contracted into engagement with said drum cylindrical portion, said clutch spring including a pair of end leg portions, the direction of the turns of said clutch spring being such as to permit pivotal movement of said lever in the brake-applying direction, but to frictionally engage said

drum cylindrical surface to prevent return movement of said lever toward its brake-released position.

7. Apparatus as claimed in claim 6, wherein said means for releasing said lever return preventing means includes a release lever pivotally connected with said mounting bracket means and operable to separate the leg portions of said clutch spring, thereby to expand said clutch spring to release the same from said gear drum.

8. A method for assembling a parking brake system of the self-adjusting cable tensioning type, including a mounting bracket, a main pivot shaft connected with said mounting bracket, a cable track member rotatably mounted on said pivot shaft, said cable track member being adapted for connection with a parking brake cable, a main bushing rotatably mounted on said pivot shaft, a spiral adjuster spring arranged concentrically about said main bushing, said spring being connected at its inner and outer ends with said bushing and with said cable track member, respectively, and an operating lever rotatably mounted on said pivot shaft between brake-applied and brake-released positions relative to said mounting bracket, comprising the steps of:

(a) connecting a load cell with said cable track member;

(b) rotating said main bushing in a direction to wind the turns of said spring together and thereby increase the tension of said spring to a predetermined value as indicated by said load cell means; and

(c) securing said main bushing to said lever, thereby to maintain the spring in the preloaded condition.

9. A method as claimed in claim 8, and further including the steps of:

(d) caging the lever and the cable track member against movement relative to said mounting bracket; and

(e) disconnecting the load cell from said cable track member.

10. A method as claimed in claim 9, and further including the steps of:

(f) connecting the cable track member with the parking brake cable of a vehicle; and

(g) uncaging the cable track member and the lever from the mounting bracket, whereby the adjuster spring expands to remove slack from the parking brake cable of the vehicle.

11. A method as claimed in claim 8, wherein said lever contains a non-circular opening through which said main pivot pin extends, said main bushing being connected at one end with said lever by staking.

12. Apparatus for operating the inner member of a coaxial vehicle parking brake cable between brake-engaged and brake-released conditions substantially as herein described with reference to Figures 2 to 22 of the accompanying drawings.

13. A method for assembling a parking brake system of the self-adjusting cable tensioning type substantially as herein described with reference to Figures 2 to 22 of the accompanying drawings.